VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

October 29, 2004

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

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50-280/281
License Nos. NPF-4/7
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VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
SURRY POWER STATION UNITS 1 AND 2
REQUEST FOR ADDITIONAL INFORMATION
BULLETIN 2003-01, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS"

In a letter dated August 7, 2003, Virginia Electric and Power Company (Dominion) provided the 60-day response to Bulletin 2003-01 for North Anna Power Station Units 1 and 2 and Surry Power Station Units 1 and 2. The bulletin requested Dominion to either (1) state that the emergency core cooling system (ECCS) and containment spray system (CSS) recirculation functions have been analyzed with respect to the potentially adverse post-accident debris blockage effects identified in the bulletin and are in compliance with all existing applicable regulatory requirements, or (2) describe any interim compensatory measures that have been implemented or that will be implemented to reduce the interim risk associated with potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance is complete.

In a letter dated September 2, 2004, the Nuclear Regulatory Commission (NRC) staff requested additional information to complete its review. Attachment 1 of this letter is the response to the request for additional information for North Anna Power Station Units 1 and 2. Attachment 2 of this letter is the response to the request for additional information for Surry Power Station Units 1 and 2.

There are no commitments contained within this letter.

Should you have any further questions regarding this matter, please contact Mr. Paul R. Willoughby at (804) 273-3572.

Very truly yours,

Leslie N. Hartz
Vice President – Nuclear Engineering

Attachments (2)

cc: U.S. Nuclear Regulatory Commission
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COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Leslie N. Hartz, who is Vice President - Nuclear Engineering of Virginia Electric and Power Company. She has affirmed before me that she is duly authorized to execute and file the foregoing document in behalf of that company, and that the statements in the document are true to the best of her knowledge and belief.

Acknowledged before me this 29TH day of October, 2004.

My Commission Expires: May 31, 2006.

Vicki L. Hull
Notary Public

(SEAL)

ATTACHMENT 1

BULLETIN 2003-01, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS"

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2

BULLETIN 2003-01, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS"
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In a letter dated September 2, 2004, the Nuclear Regulatory Commission (NRC) staff requested additional information to complete its review. Below is the response to the request for additional information for North Anna Power Station Units 1 and 2.

NRC Question 1

On page 3 of Attachment 1 of your Bulletin 2003-01 response you state that "the process and schedule to change and issue revisions to the ERGs [Emergency Response Guidelines] to address containment blockage issues is expected to be completed by March 31, 2004. Dominion will participate in these WOG activities and evaluate any recommended changes to determine if they are appropriate for NAPS." The WOG has developed operational guidance in response to Bulletin 2003-01 for Westinghouse and CE type pressurized-water reactors (PWRs). Please provide a discussion of your plans to consider implementing this new WOG guidance. Include a discussion of the WOG-recommended compensatory measures that have been or will be implemented at your plant, and the evaluations or analyses performed to determine which of the WOG-recommended changes are acceptable at your plant. Provide technical justification for those WOG-recommended compensatory measures not being implemented by your plant. Also include a detailed discussion of the procedures being modified, the operator training being implemented, and your schedule for implementing these compensatory measures.

Dominion Response

Attachment 1 to Dominion letter 03-368 dated August 7, 2003, provided the North Anna Power Station (NAPS) response to NRC Bulletin 2003-01. Dominion

described enhancements to the NAPS Emergency Operating Procedures (EOPs) that would decrease the risk associated with potential sump blockage while not impacting the current symptom-based response strategies in the EOPs. The enhancements were identified as:

- Provide for continuous monitoring of key sump performance indicators to ensure transfer to ECA 1.1 on indications of pump cavitation due to debris blockage of the sump.
- Streamline ECA 1.1 instructions to identify debris blockage as the reason for the loss of recirculation and to prioritize sources of alternate core cooling.

Dominion committed to implement the EOP revisions with training before March 31, 2004. Dominion has satisfied this commitment by modifying EOPs ES-1.3, "Transfer to Cold Leg Recirculation," and ECA-1.1, "Loss of Emergency Coolant Recirculation" in accordance with the commitment schedule. Changes to ES-1.3 provide the control room operator with instructions to: 1) monitor diverse indicators of sump performance after recirculation is initiated; 2) identify degraded sump performance (from blockage or other causes); and, 3) transition to ECA-1.1 if all ECCS pumps have been stopped. Changes to ECA-1.1 provide the operator with instructions to respond to a loss of recirculation with sources of alternate core cooling until a recirculation path can be established. ECA-1.1 also provides instructions for refueling water storage tank (RWST) backfill and other mitigative actions.

Plant simulator validation runs were performed with multiple operator teams to simulate a loss of sump recirculation after a loss of coolant accident. The simulator scenarios exercised the EOP changes and demonstrated a consistent level of response from control room operators.

Subsequent to the implementation of the NAPS EOP changes, the Westinghouse Owners Group (WOG) published WCAP-16204, Revision 1, "Evaluation of Potential ERG and EPG Changes to Address NRC Bulletin 2003-01 Recommendations (PA-SEE-0085)," March 2004. The WCAP consists of three volumes: Volume 1 describes the engineering evaluations of potential Emergency Response Guideline (ERG) changes; Volume 2 presents proposed changes to the Westinghouse ERGs; and Volume 3 presents proposed changes to the Combustion Engineering Emergency Procedure Guidelines (EPGs). Volumes 1 and 2 are applicable to NAPS.

The WOG recommendation was to implement the Sump Blockage Control Room Guideline (SBCRG) documented in Volume 2 to WCAP-16204, Revision 1, as an interim compensatory action to reduce the risk associated with sump blockage. The SBCRG is a generic procedure, separate from the ERG network, for responding to loss of recirculation due to debris blockage of the containment sump. Specifically, Volume 2 of WCAP-16204, Revision 1, identified seven major

actions, listed below, to be performed in response to loss of sump recirculation in a Westinghouse plant with a large dry containment.

- Protect ECCS and CSS pumps
- Establish and maintain optimum emergency coolant flow
- Increase/conserve RWST level
- Initiate cooldown to cold shutdown
- Depressurize the RCS to minimize RCS subcooling
- Depressurize steam generators to cool down and depressurize RCS
- Maintain RCS heat removal

Dominion reviewed the SBCRG and concluded that the NAPS plant-specific changes, incorporated in the NAPS EOPs and implemented in March 2004, addressed the issues covered by the SBCRG.

Los Alamos National Laboratory technical report LA-UR-02-7562, "The Impact of Recovery from Debris-Induced Loss of ECCS Recirculation on PWR Core Damage Frequency," published in February 2003, analyzes the potential risk benefit of operator actions to recover from sump clogging events. The report was cited in NRC Bulletin 2003-01 as a major reason for issuing the bulletin and recommending compensatory measures that provide operators with instructions to recover. Section 4.0 of the report concluded "it is evident that recovery actions reduce substantially the CDF with debris effects for all plants." The potential risk due to sump clogging could be reduced by approximately one order of magnitude when allowing for recovery. The NAPS plant-specific CDF analysis considering containment sump blockage without recovery was reduced by a factor of approximately 35 when the analysis considered the effect of recovery by operator actions. The NAPS EOPs provide operators with recovery instructions that provide sufficient risk reduction as described in LA-UR-02-7562.

In conclusion, NAPS has implemented plant-specific EOP changes that equip the control room operators with instructions to monitor key sump performance indicators, to identify sump blockage, and to respond to loss of sump recirculation. The EOP changes implement the major actions recommended by the WOG in the SBCRG and are appropriate for use in the NAPS EOPs. The NAPS EOP methods to recover from a loss of recirculation provide sufficient risk reduction as evaluated in LA-UR-02-7562. No additional compensatory measures related to EOPs are being implemented at NAPS.

NRC Question 2

NRC Bulletin 2003-01 provides possible interim compensatory measures licensees could consider to reduce risks associated with sump clogging. In addition to those compensatory measures listed in Bulletin 2003-01, licensees may also consider implementing unique or plant-specific compensatory measures, as applicable. Please discuss any possible unique or plant-specific compensatory measures you considered for implementation at your plant. Include a basis for rejecting any of these additional considered measures.

Dominion Response

Attachment 1 to Dominion letter 03-368, dated August 7, 2003, discussed the Dominion implementation of interim compensatory measures for the generic letter. In addition, North Anna has the plant-specific capability to deliver charging flow through a unit-to-unit cross connect. This feature is utilized in ECA-1.1 for alternate core cooling.

During our evaluation of Bulletin 2003-01, Dominion reviewed the plant design, safety analyses, and EOPs to identify other possible compensatory actions that would provide additional NPSH margin to offset the consequences of containment debris during a design basis accident. Dominion reviewed plant operating conditions (e.g., RWST level and containment air partial pressure) against the accident analysis assumptions that create minimum NPSH available margin. It was concluded that minor changes to normal plant operating conditions would not have a significant impact on NPSH available or yield a significant risk benefit. Thus, no changes to operating conditions were made.

ATTACHMENT 2

BULLETIN 2003-01, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS"

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2

BULLETIN 2003-01, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS"
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In a letter dated August 7, 2003, Virginia Electric and Power Company (Dominion) provided the 60-day response to Bulletin 2003-01 for North Anna Power Station Units 1 and 2 and Surry Power Station Units 1 and 2. The bulletin requested Dominion to either (1) state that the emergency core cooling system (ECCS) and containment spray system (CSS) recirculation functions have been analyzed with respect to the potentially adverse post-accident debris blockage effects identified in the bulletin and are in compliance with all existing applicable regulatory requirements, or (2) describe any interim compensatory measures that have been implemented or that will be implemented to reduce the interim risk associated with potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance is complete.

In a letter dated September 2, 2004, the Nuclear Regulatory Commission (NRC) staff requested additional information to complete its review. Below is the response to the request for additional information for Surry Power Station Units 1 and 2.

NRC Question 3

On page 3 of Attachment 2 of your Bulletin 2003-01 response you state that "the process and schedule to change and issue revisions to the ERGs to address containment blockage issues is expected to be completed by March 31, 2004. Dominion will participate in these WOG activities and evaluate any recommended changes to determine if they are appropriate for SPS." The WOG has developed operational guidance in response to Bulletin 2003-01 for Westinghouse and CE type PWRs. Please provide a discussion of your plans to consider implementing this new WOG guidance. Include a discussion of the WOG-recommended compensatory measures that have been or will be implemented at your plant, and the evaluations or analyses performed to determine which of the WOG-recommended changes are acceptable at your plant. Provide technical justification for those WOG-recommended compensatory measures not being implemented by your plant. Also include a detailed discussion of the procedures being modified, the operator training being implemented, and your schedule for implementing these compensatory measures.

Dominion Response

Attachment 2 to Dominion letter 03-368 dated August 7, 2003, provided the Surry Power Station (SPS) response to NRC Bulletin 2003-01. Dominion described

enhancements to the SPS Emergency Operating Procedures (EOPs) that would decrease the risk associated with potential sump blockage while not impacting the current symptom-based response strategies in the EOPs. The enhancements were identified as:

- Provide for continuous monitoring of key sump performance indicators to ensure transfer to ECA 1.1 on indications of pump cavitation due to debris blockage of the sump.
- Streamline ECA 1.1 instructions to identify debris blockage as the reason for the loss of recirculation and to prioritize sources of alternate core cooling.

Dominion committed to implement the EOP revisions with training before March 31, 2004. Dominion has satisfied this commitment by modifying EOPs ES-1.3, "Transfer to Cold Leg Recirculation," and ECA-1.1, "Loss of Emergency Coolant Recirculation" in accordance with the commitment schedule. Changes to ES-1.3 provide the control room operator with instructions to: 1) monitor diverse indicators of sump performance after recirculation is initiated; 2) identify degraded sump performance (from blockage or other causes); and, 3) transition to ECA-1.1 if all ECCS pumps have been stopped. Changes to ECA-1.1 provide the operator with instructions to respond to a loss of recirculation with sources of alternate core cooling until a recirculation path can be established. ECA-1.1 also provides instructions for refueling water storage tank (RWST) backfill and other mitigative actions.

Plant simulator validation runs were performed with multiple operator teams to simulate a loss of sump recirculation after a loss of coolant accident. The simulator scenarios exercised the EOP changes and demonstrated a consistent level of response from control room operators.

Subsequent to the implementation of the NAPS EOP changes, the Westinghouse Owners Group (WOG) published WCAP-16204, Revision 1, "Evaluation of Potential ERG and EPG Changes to Address NRC Bulletin 2003-01 Recommendations (PA-SEE-0085)," March 2004. The WCAP consists of three volumes: Volume 1 describes the engineering evaluations of potential Emergency Response Guideline (ERG) changes; Volume 2 presents proposed changes to the Westinghouse ERGs; and, Volume 3 presents proposed changes to the Combustion Engineering Emergency Procedure Guidelines (EPGs). Volumes 1 and 2 are applicable to SPS.

The WOG recommendation was to implement the Sump Blockage Control Room Guideline (SBCRG) documented in Volume 2 to WCAP-16204, Revision 1, as an interim compensatory action to reduce the risk associated with sump blockage. The SBCRG is a generic procedure, separate from the ERG network, for responding to loss of recirculation due to debris blockage of the containment sump. Specifically, Volume 2 of WCAP-16204, Revision 1, identified seven major

actions, listed below, to be performed in response to loss of sump recirculation in a Westinghouse plant with a large dry containment.

- Protect ECCS and CSS pumps
- Establish and maintain optimum emergency coolant flow
- Increase/conserve RWST level
- Initiate cooldown to cold shutdown
- Depressurize the RCS to minimize RCS subcooling
- Depressurize steam generators to cool down and depressurize RCS
- Maintain RCS heat removal

Dominion reviewed the SBCRG and concluded that the SPS plant-specific changes, incorporated in the SPS EOPs and implemented in March 2004, addressed the issues covered by the SBCRG.

Los Alamos National Laboratory technical report LA-UR-02-7562, "The Impact of Recovery from Debris-Induced Loss of ECCS Recirculation on PWR Core Damage Frequency," published in February 2003, analyzes the potential risk benefit of operator actions to recover from sump clogging events. The report was cited in NRC Bulletin 2003-01 as a major reason for issuing the bulletin and recommending compensatory measures that provide operators with instructions to recover. Section 4.0 of the report concluded "it is evident that recovery actions reduce substantially the CDF with debris effects for all plants." The potential risk due to sump clogging could be reduced by approximately one order of magnitude when allowing for recovery. The SPS plant-specific CDF analysis considering containment sump blockage without recovery was reduced by a factor of approximately 125 when the analysis considered the effect of recovery by operator actions. The SPS EOPs provide operators with recovery instructions that provide sufficient risk reduction as described in LA-UR-02-7562.

In conclusion, SPS has implemented plant-specific EOP changes that equip the control room operators with instructions to monitor key sump performance indicators, to identify sump blockage, and to respond to loss of sump recirculation. The EOP changes implement the major actions recommended by the WOG in the SBCRG and are appropriate for use in the Surry EOPs. The SPS EOP methods to recover from a loss of recirculation provide sufficient risk reduction as evaluated in LA-UR-02-7562. No additional compensatory measures related to EOPs are being implemented at SPS.

NRC Question 4

NRC Bulletin 2003-01 provides possible interim compensatory measures licensees could consider to reduce risks associated with sump clogging. In addition to those compensatory measures listed in Bulletin 2003-01, licensees may also consider implementing unique or plant-specific compensatory measures, as applicable. Please discuss any possible unique or plant-specific compensatory measures you considered for implementation at your plant. Include a basis for rejecting any of these additional considered measures.

Dominion Response

Attachment 2 to Dominion letter 03-368, dated August 7, 2003, discussed the Dominion implementation of interim compensatory measures for the generic letter. In addition, Surry has the plant-specific capability to provide high head charging flow through a unit-to-unit cross connect. This feature is utilized in ECA-1.1 for alternate core cooling.

During our evaluation of Bulletin 2003-01, Dominion reviewed the plant design, safety analyses, and EOPs to identify other possible compensatory actions that would provide additional NPSH margin to offset the consequences of containment debris during a design basis accident. Dominion reviewed plant operating conditions (e.g., RWST level and containment air partial pressure) against the accident analysis assumptions that create minimum NPSH available margin. It was concluded that minor changes to normal plant operating conditions would not have a significant impact on NPSH available or yield a significant risk benefit. Thus, no changes to operating conditions were made.